# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-233934

(43)Date of publication of application : 02.09.1998

(51)Int.Cl. H04N 1/60
G06T 5/00
G06T 7/00
G09G 5/02
H04N 1/46

(21)Application number : 10-057254

(22)Date of filing : 09.03.1998

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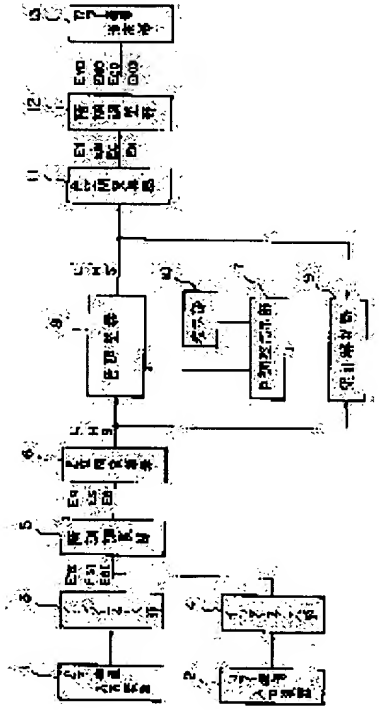
## (54) IMAGE PROCESSING METHOD AND DEVICE THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To adjust colors in accordance with a user's taste by interactively setting a gradation correction state based on a shown graphic display and processing an object image to be processed according to the gradation correction state that is interactively set.

SOLUTION: When a color space converter 6 inputs image data in a default state, it is converted into image data (L, H and S) and outputted to a color adjusting device 8 and a statistical analyzer 9. Frequency distribution data of lightness L that is calculated by the analyzer 9 is shown by a distribution curve with a vertical direction of an LCD that is an indicator 10 as lightness level and a horizontal direction as a frequency. Further, a mode, the maximum value and the minimum value which are calculated by the analyzer 10 are shown on an LED group, and the array of the LED group corresponds to the lightness level of the LCD. In this way, the brightness information of an object image to be processed is analyzed and an analyzed result is performed in graphic display. And gradation correction state is interactively set, and the object image to be processed is processed according to the gradation state that is interactively set.



LEGAL STATUS

| | |
|---|---|
| [Date of request for examination] | 09.03.1998 |
| [Date of sending the examiner's decision of rejection] | |
| [Kind of final disposal of application other than the examiner's decision of rejection or application converted registration] | |
| [Date of final disposal for application] | |
| [Patent number] | 3190308 |
| [Date of registration] | 18.05.2001 |
| [Number of appeal against examiner's decision of rejection] | |
| [Date of requesting appeal against examiner's decision of rejection] | |
| [Date of extinction of right] | |

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image-processing approach and equipment which input a color picture signal and carry out color adjustment.
[0002]
[Description of the Prior Art] Color picture data separate the color of a color picture optically, and although obtained by changing each into an electrical signal, generally they are treated in many cases with three chrominance signals (ER, EG, and EB), i.e., a three-primary-colors signal. Here, they are Signals ER, EG, and EB. Each is red, green, and a signal showing the reinforcement of a blue color, and is greatly dependent on the property of the light filter whose color is separated, i.e., the property of a picture input device. Therefore, it is necessary to reproduce a color picture according to the property of a picture input device with the color picture formation equipment which forms a color visible image based on a three-primary-colors signal (ER, EG, and EB). As such a system, television systems are systems in consideration of a double lump of the property of the television monitor (receiving set) which is the property and image formation equipment of a video camera which are a picture input device. Moreover, it doubles with the appearance by which the color picture inputted as the color reader which is a color picture input unit in consideration of the color property of the color printer which is color picture formation equipment is reproduced in a color copying machine.
[0003] In the color printer of such a copying machine, when carrying out image formation based on the color picture data (for example, color picture signal from the video camera currently treated with television systems) inputted from other than the color reader reserved (picture input device from which a property differs), since the color properties of a picture signal differ, a certain adjustment is needed in the case of the usual copy.
[0004]
[Problem(s) to be Solved by the Invention] Although a color picture input unit and color picture formation equipment can generally make it double (adjustment) to some extent like a color copying machine in the closed system combined by 1 to 1 in this color property, a double lump of the color property mentioned above in the open system which can combine with one color picture formation equipment the color picture input unit of the mold with which plurality differs is not easy.
[0005] Moreover, when outputting the color picture data which recorded on videotape the color picture data read with the color picture input device with an indefinite color property to package media, such as a VTR cassette tape, and were reproduced with playback machines, such as VTR (video tape recorder), to a color printer, since the color property of the picture input device which is the target to double is unknown, it is not easy to perform a double lump of a color property.
[0006] Moreover, generally the color picture data of a color picture input device are expressed with the three-primary-colors signal (ER, EG, and EB). For this reason, although a double lump and adjustment of a color property can be performed comparatively easily in the television monitor which forms a color picture by the additive mixture of colors of the three light sources (red, green, blue) The signal EY

which controls the amount of three coloring matter (Y, M, C) by the color printer which forms a color picture with the subtractive color mixture of three coloring matter (Y; Hierro, M; Magenta, C; cyanogen) from a three-primary-colors signal (ER, EG, and EB), EM, and EC It is necessary to change image data. In this case, especially the transfer characteristics of a system become complicated and a double lump and adjustment of a color property become complicated.

[0007] Since conventional color picture formation equipment was performing the double lump of a color property according to the property of a specific color picture input unit as explained above, The color picture data from two or more color picture input devices which have various color properties, When outputting and carrying out image formation of the color picture data with the indefinite property of the color picture input device which inputted the color picture with color picture formation equipment, in order for adjustment of the property of a color not to work, the technical problem that repeatability fell in respect of the repeatability and the color tone of a color, or brightness occurred. Moreover, although such a color printer etc. was adjusted so that it could respond to each color property beforehand to a color picture input unit, and the user was provided with it, it had problems, like the color adjustment by the complexity of adjustment and liking of a user is difficult.

[0008] This invention was made in view of the above-mentioned conventional example, and aims at the image-processing approach that the gradation of a processing-object image is amended interactively and can be processed, and making equipment offer.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the image processing system of this invention consists of the following configurations. That is, the brightness information on a processing-object image is analyzed, and it is characterized by having the display means which carries out graphical display of the analysis result, a setting means to set up a gradation amendment condition interactively based on the graphical display displayed on said display means, and a processing means to process said processing-object image according to the gradation amendment condition interactively set up by said setting means.

[0010] Moreover, in order to attain the above-mentioned purpose, the image-processing approach of this invention is equipped with the following processes. That is, the brightness information on a processing-object image is analyzed, graphical display of the analysis result is carried out, and it is characterized by processing said processing-object image according to the gradation amendment condition which set up the gradation amendment condition interactively and was set up interactively.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained to a detail with reference to an accompanying drawing.

[0012] [Explanation [ ( drawing 1 ) ] of color picture processor] drawing 1 is the block diagram showing the outline configuration of the color picture processor of the gestalt of this operation.

[0013] In drawing, 1 and 2 are color picture input units like a color reader which read a color copy image and input it in photoelectricity respectively, and the color properties of two picture input devices may differ here. 3 and 4 are the interface sections which perform timing of each color picture input units 1 and 2 and the image-processing section containing the various controllers mentioned later, and adjustment of a signal. 5 is the three-primary-colors signal ER which performs comparison of a signal (three-primary-colors signals ERI, EGI, and EBI inputted here), and adjustment of gradation, and corresponds, respectively, EG, and EB. It changes and is the gradation controller to output.

[0014] 6 is the three-primary-colors signal ER by which gradation adjustment was carried out, EG, and EB. It is the color space conversion machine changed into the color space data (L, H, S) which suited vision and feeling of a user (human being). The color tone ready directions section into which, as for 7, adjustment directions of a color are inputted by the operator, and 8 are color tone ready machines which adjust color space data (L, H, S) according to directions of the color tone ready directions section. The statistical analysis machine which calculates the statistic of the color space data of the pixel before and behind the object pixel in which 9 carries out color adjustment, and 10 are displays, such as a color CRT which displays a color picture actual in displaying the statistic calculated with the statistical analysis

vessel 9.
[0015] The color space conversion machine which changes the color space data (L', H', S') by which color adjustment of 11 was carried out with the color tone ready vessel 8 into the signal (the signal EY which controls the amount of Y, M, and C for coloring matter here, EM, and EC) which suited the color picture formation section 13, 12 is Signal EY, EM, and EC. The gradation controller which performs comparison and adjustment of gradation and outputs EYO corresponding to each signal, EMO, and an ECO signal, Change color picture data into a color visible image based on EYO, EMO, and an ECO signal, for example, 13 is the color picture formation section of **, such as an electrophotography method and a hot printing method.
[0016] By the above configuration, the color picture input units 1 and 2 output the color picture signal which read the color copy and was changed into the electrical signal to the interface sections 3 and 4. In these interface sections 3 and 4, while doubling timing with processing following below, a color picture signal is changed into red, green, and the blue three-primary-colors signals ERI, EGI, and EBI. Moreover, when the color picture signal which a color picture input unit outputs is an analog quantity, the interface sections 3 and 4 perform A/D conversion, and change and output it to a digital signal.
[0017] Therefore, the interface sections 2 and 3 are greatly dependent on the property and configuration of the color picture input units 1 and 2, and have the color picture input unit 1 which corresponds, respectively, or the property corresponding to 2. Gradation adjustment is carried out by the gradation controller 5, and the three-primary-colors signals ERI, EGI, and EBI outputted from the interface section 3 or 4 serve as the three-primary-colors signal ER, EG, and EB. Here, when aiming at taking out to especially CRT of television, since gamma amendment is beforehand performed in consideration of the gamma characteristics of CRT, the three-primary-colors signals ERI, EGI, and EBI perform reverse amendment of amendment by the gradation controller 5.
[0018] Moreover, they are the three-primary-colors signal ER, EG, and EB so that, as for the gradation controller 5, a dynamic range may become large, when the color picture input devices 1 and 2 output criteria white and criteria black. When quantizing by 8 bits, in criteria white, it adjusts to ER =EG =EB =0 by ER =EG =EB =255 (level) and criteria black. Such gradation adjustment can consist of RAM and a ROM using the method of a look-up table. Thus, the adjusted three-primary-colors signal ER, EG, and EB It is changed into the data of the color space which suits vision and feeling of human being (user) with the color space conversion vessel 6.
[0019] [explanation of the conversion approach of a color space ( drawing 2 )] -- an example of a conversion method which changes a color space here is shown. Hue H and the color showing Lightness L and red who express the bright degree of the brightness of being dark, as a color space which suits vision and feeling of human being here, yellow, green, blue, and the tone of being purple make three attributes saturation S showing the degree of the vividness of a thin color called vividness [ a color ], and the color space shown according to a cylindrical coordinate system as shown in drawing 2 is used.
[0020] Here, they are the three-primary-colors signal ER, EG, and EB. L=f1 (ER, EG, and EB)
H=f2(ER,EG,EB )
S=f3 (ER, EG, and EB) Formula (1)
It carries out and how to carry out direct conversion is also considered. Here, f1, f2, and f3 express the function, respectively. Moreover, since the three-primary-colors signals ER, EG, and EB are digital signals, the number of concentration level is also limited. That is, if it is 8 bits of quantization, for example, the number of level is "256." Therefore, since the relation of one formula can be expressed in a table (look-up table), it can constitute the color space conversion machine 6 using RAM or ROM.
[0021] One example of the technique of asking for this look-up table is shown below.
[0022] They are the three-primary-colors signal ER, EG, and EB first. It must be decided what kind of color is expressed. However, the three-primary-colors signal ER in which gradation adjustment was carried out by the color property of the color picture input units 1 and 2 etc., EG, and EB Differing is expected and the color by which image formation is carried out is the three-primary-colors signal ER, EG, and EB. ******** of the color by which image formation is carried out cannot be performed completely. Then, since it aims at what is usually displayed on a color television receiver, the television

camera which is one of the color picture input devices is the three-primary-colors signal ER, EG, and EB here. It is considered that the color to express is a thing corresponding to the color reproduced with a color television receiver. Generally, also in a color picture output unit, for a comparatively large **** reason, even if the color reproduction range of a color television receiver assumes the color of a color picture to this appearance, color correction of it can be carried out by consecutive processing.
[0023] The coordinate of the color of the fluorescent substance of a color television receiver is set to (xG, yG, zG), and (xB, yB and zB) to each of red, green, and blue (xR, yR, and zR), and the coordinate of the color of a basic stimulus is set to (xW, yW, and zW). These are known values or values which can be measured, and are on the chromaticity coordinate in CIE1931 XYZ color system.
[0024] Then, an XYZ color system, the three-primary-colors signal ER, EG, and EB Generally transformation is. |ER| |Rx RY RZ| |X| |EG|=|Gx GY GZ| x |Y| |EB| |Bx BY BZ| |Z| Formula (2)
it comes out and expresses -- having -- the coordinate of the color of the above-mentioned fluorescent substance and a basic stimulus to nine equations -- it can obtain -- matrix M1 **

$$M1 = \begin{vmatrix} Rx & RY & RZ \\ Gx & GY & GZ \\ Bx & BY & BZ \end{vmatrix}$$

It can ask more. Therefore, the three-primary-colors signal ER, EG, and EB Formula changed into an XYZ color system |X| |ER| |Y|= (M1) 1st [ -] power - |EG| Formula (3)
| Z| It becomes |EB|. -1 power of M1 is the reverse matrix of M1 here. In addition, (XW, YW, and ZW) show the coordinate of the XYZ color system showing the color (standard white) which is a basic stimulus. moreover, the three-primary-colors signal ER, EG, and EB standard white -- receiving -- ER =EG =EB = -- it is adjusted in many cases so that it may become fixed.
[0025] Next, CIE1976L* u* v* which is uniform color space from an XYZ color system It changes.
[0026]
1-/cube of L*= 116 (Y/Yo) -16 (Y/Yo> 0.008856) u*= 13 and L* (u' - uo') v*= 13 and L* (v' - vo') Formula (4)
It corrects. u'= 4X/(X+15Y+3Z), v' = 9Y / (X+15Y+3Z) such uniform color space is L* u* v* in CIE1976. Otherwise, it is CIE1976L* a* b*. It is. Axis-of-coordinates L* in such uniform color space, u*, and v* It is a rectangular coordinate system and the system of coordinates which changed this into the cylindrical coordinate system are LHS system of coordinates.
[0027] The conversion L=L* 1st [ -] power of H= {tan (v*/u*)} Square root of S= (square of square +v* of u*) Formula (5)
although come out and expressed -- the quantization step of L, H, and S, L*, u*, and v* A quantization step is not necessarily equal. Moreover, it is CIE1976L* a*b* as equal color conversion. It can also use.
[0028] Formula (2) The color space conversion machine 6 can also be constituted making hard the data which can make the data showing the relation of a formula (1), and express this the conversion of a series of for every step from a series of conversion to - (5), and by making two or more steps hard collectively.
[0029] The image data (L, H, S) changed into the LHS color space with the color space conversion vessel 6 is inputted into the color tone ready machine 8. At the time of starting of equipment and reset, by the default, this color tone ready machine 8 is set up so that it may be outputted to the color space conversion section 11, without adjusting image data (L, H, S). If an operator directs color adjustment from the color tone ready designating device 7 to the color tone ready machine 8 so that it may mention later, the color tone ready machine 8 will carry out color adjustment of the image data (L, H, S) inputted according to the directions, and will output it to the color space conversion section 11 as image data (L', H', S').
[0030] On the other hand, the statistical analysis machine 9 asks for the frequency distribution and the statistical data (**, such as the average, the mode, maximum, and the minimum value) of image data (L, H, S), and displays them on a display 10. The operator who is a user displays on the indicative data 10 in

a display 10. The operator who is a user directs color adjustment from the color tone ready directions section 7, referring to the indicative data of a display 10. Furthermore, to the image data (L', H', S') by which color adjustment of the statistical analysis machine 9 was carried out, in quest of the statistical data and frequency distribution, it displays on a display 10, and an operator refers to the display of a display 10 and performs color adjustment similarly. In case this color adjustment is performed, the lightness L which is the attribute of a LHS color space, Hue H, and saturation S can be adjusted independently, respectively.

[0031] Thus, the image data (L', H', S') by which color adjustment was carried out, or the image data (L, H, S) which has not been adjusted is changed into the playback image data (EY, EM, EC, and EK) in the color picture formation section 13 in the color space conversion machine 11. The transformation at this time is EY =fY (L', H', S').

EM =fM (L', H', S')

EC =fC (L', H', S')

EK =fK (L', H', S') Formula (6)

It is also possible for it to be expressed with the becoming relational expression and to make it a look-up table based on this formula.

[0032] Depending on the color picture formation method of the color picture formation section 13, it can ask for this transformation in a certain precision range beforehand. In addition, EY, EM, EC, and EK Each is equivalent to the concentration control signal of each color (Hierro, a Magenta, cyanogen, black) of coloring material (**, such as a toner and ink) used in the image formation section 13.

[0033] Next, in the gradation controller 12, gradation adjustment is performed, respectively, and image data (EY, EM, EC, and EK) is outputted to the color picture formation section 13 in image data (EY0, EM0, EC0, EK0). This color picture formation section 13 reproduces and outputs a visible color picture based on that image data (EY0, EM0, EC0, EK0).

[0034] Drawing 3 and drawing 4 are used and an example of the technique of color tone ready directions is explained below to [explanation of color tone ready directions ( drawing 3 , drawing 4 )].

[0035] Drawing 3 is the lightness adjustment directions section which directs adjustment of Lightness L, and is equivalent to a part of color tone ready directions section 7 and display 10. Drawing 4 is equivalent to a part of color tone ready directions section 7 in Hue H and saturation S in the tint adjustment directions section which directs adjustment independently.

[0036] In drawing 3 , SW1-SW5 are the switches which direct the degree of Lightness L, and SW1-SW3 can make vertical migration carry out towards the drawing Nakaya mark. Moreover, SW4 and SW5 are turned on and off by carrying out a depression, and LED by which switch built-in was carried out lights at the time of an ON state. Moreover, 30 is an LED group, and LED 1-16 is displayed according to the stage of the statistics parameter of Lightness L, and since it is easy here, it is explained by 16 cases.

[0037] Moreover, 31 shows the display screen of a liquid crystal display, and is expressing the configuration of the frequency distribution of Lightness L. The preparation of Lightness L based on the above configuration is explained. In the time of power-source starting and reset, the color tone ready directions section 7 will also be in an ON state by clearing the display of LED 1-16 and LCD31 by the default, and SW4 and SW5 direct a default in the color tone ready vessel 8. The color tone ready machine 8 outputs the image data inputted without carrying out color adjustment as it is by this default.

[0038] If the color space conversion machine 6 inputs image data by the default now, image data will be changed into (L, H, S) as mentioned above, and it will output to the color tone ready machine 8 or the statistical analysis machine 9. The frequency distribution data of Lightness L for which it asked with this statistical analysis vessel 10 make lightness level the lengthwise direction of LCD31 which is a display 10, and display it like distribution 91 by making a longitudinal direction into frequency. Furthermore, the mode m0 for which it asked with the statistical analysis vessel 10, maximum MAX0, and the minimum value MIN0 It is displayed on the LED group 30 and the array of the LED group 30 and the lightness level of LCD31 correspond at this time. In addition, in drawing 3 , the direction of [ upper ] is made into the one, i.e., the white direction, where lightness level is higher, and the direction of [ lower ] is conversely made into the direction of black.

[0039] It sets to 91 of drawing 3 and is the mode m0. Corresponding to 9th LED9, maximum MAX0 is the minimum value MIN0 to 4th LED4. It is displayed corresponding to 13th LED13. SW5 is pushed and it is made an OFF state, SW3 is moved upwards (when making it bright), or it is made to move downward here, when making distribution of Lightness L bright on the whole or dark (when making it dark). Moreover, in order to change the range of distribution of Lightness L, SW4 is pushed first, it is made an OFF state, and SW1 is moved, the range of the brighter one is moved, SW2 is moved, and the range of the darker one is moved. At this time, they are frequency distribution data, the mode m0, and the minimum value MAX0. Minimum value MIN0 New frequency distribution data are made from the new mode m directed by SW1, SW2, and SW3, Maximum MAX, and the minimum value MIN, and it displays on LED corresponding to distribution 92. That is, the display of the LED group 30 changes so that it may synchronize with migration of SW1-SW3. In addition, when there are no original frequency distribution data, at the time of power-source starting and reset, such new distribution 92 or distribution 91 are not displayed.
[0040] Below, how to make such new distribution data is shown.
[0041] Lightness L0 which is the old distribution data now Frequency D0 When correspondence is set to D0 =g1 (L0), correspondence of the Lightness L and the frequency D which are new distribution data is D=g2(L) =g1 (h (L)).
Although it becomes, it is h here (L). (MAX0-m0) -(L-m)/+(MAX-m) m0 (at the time of L >=m)
h (L) = (m0-MIN0) -(L-m)/(m-MIN)+m0 (at the time of L<m)
It is come out and expressed. However, frequency D is L>=MAX at the time of MAX <=m. It is set to "0" and frequency D is L<=MIN at the time of MIN >=m. It is set to "0." It is m=m0 if it will be now set to MIN =MIN0 and MAX =MAX0 if SW4 is an ON state, and SW5 is an ON state. It becomes.
Creation of such new distribution data is performed in the color tone ready directions section 7, and the method which transmits to a display 10 and is displayed on it, the method which transmits and displays various parameters (m0, MAX0, MIN0), the amount of directions (m, MAX, and MIN), etc. on a display 10 through the color tone ready directions section 7, creates new distribution data with directions of an operator, and is displayed can consider.
[0042] Moreover, similarly, delivery and a bottom type are used for the color tone ready machine 8 for various parameters (m0, MAX0, MIN0) and the amount of directions (m, MAX, and MIN) from the color tone ready directions section 7, and it is the old lightness L0. It changes into the new lightness L.
[0043]
(MAX-m)-(L0-m0)/(MAX0-m0) +mL= (at the time of L0 >=m0)
(MIN-m)-(L0-m0)/(MIN0-m0) +m (at the time of L0 <m0)
Or the amount of adjustments (alpha 1, beta 1, alpha 2, and beta 2) is calculated by the bottom type in the color tone ready directions section 7 from various parameters (m0, MAX0, MIN0) and the amount of directions (m, MAX, and MIN). Namely, alpha1 =(MAX-m)/(MAX0-m0)
beta1 =alpha1 and m0+malpha2 =(MIN-m)/(MIN0-m0)
It asks for beta2 =alpha2 and m0+m, and is each amount of adjustments (alpha 1, beta 1, alpha 2, and beta 2) to the color tone ready machine 8 Delivery, and L=alpha 1 and L0+beta1 (at the time of L0 >=m0)
L=alpha 2 and L0+beta2 (at the time of L0 <m0)
The method to adjust is also considered.
[0044] moreover, the above-mentioned approach -- although an operation is required even if it carries any out -- this operation -- hardware -- carrying out -- sequential ** -- there are the approach of creating the new lightness L, an approach of calculating with software using CPU etc., and the approach of memorizing the value calculated beforehand to ROM or RAM, and creating a look-up table.
[0045] Next, adjustment of Hue H is explained.
[0046] Here, in order to simplify, it explains by the case where a hue is divided and adjusted to six, (Red R) Orange (O), yellow (Y), green (G), blue (B), and purple (P). Moreover, since actuation of a user will become complicated if the hue to divide actually increases, dividing about into six is appropriate.
[0047] Each of SW6-SW11 which were shown in drawing 4 is a switch for directing adjustment of these

six hues. It is the switch which switches whether SW18 changes adjustment of a hue into the adjustment condition of having been directed by the default, or it changes into the adjusted hue condition. In addition, he is trying to pass a default without adjustment of a hue here. And when carrying out adjustment directions of a hue, it changes into the adjustment condition which made SW18 the OFF state and was directed by SW6-SW11.

[0048] the hue adjusted now -- for example, green -- green, when considering the time of being referred to as (G) SW9 is moved in the direction of SW8 -- hue HG of (G) The color which it has wears yellow. on the contrary, green, when SW9 is moved in the SW10 direction -- hue HG of (G) The color which it has wears blueness. At this time, the augend of yellow and blueness is distance **dG from the normal position (NandP) 41 of SW9. It is determined.

[0049] The color tone ready directions section 7 calculates amount **dG of gaps from the normal position 41 of SW9 (here, the direction of a counterclockwise rotation is made forward) in this case, and this adjustment approach directs adjustment of a hue also in the color tone ready vessel 8. the color tone ready machine 8 which received these directions has green image data (L, H, S) -- hue HG of (G) It is in a field, or if judge and it is, **H=fHG (**dG) will be added to the hue H of the original image data, and if there is nothing, the hue H of the original image data will be passed as it is. In addition, the judgment of this hue is the hue HG which the original hue H determined beforehand. It investigates whether it is in a field (HGmin-HGmax) based on size relation. That is, if it becomes HGmin<=H<=HGmax, it will consider as H'=H+fHG(**dG) =H+**H, however **H=fHG (**dG).

[0050] It will be referred to as H'=H if it is H<HGmin or H>HGmax. Here, fHG expresses the function and can constitute it from a look-up table etc. Thus, it carries out similarly about other hues.

[0051] Next, adjustment of saturation S is explained.

[0052] Adjustment of saturation S is carried out to each hue H of every. Therefore, here explains by the case where the number of partitions of the above-mentioned hue H is six. In drawing 4 , SW12-SW19 are switches which direct adjustment of saturation S. It is the switch which switches whether SW19 changes adjustment of saturation into a default or the adjustment condition of having been directed. In addition, a default is the case where it is made to pass without adjustment of saturation.

[0053] When carrying out adjustment directions of saturation, SW19 is made into an OFF state and it changes into an adjustment condition. the hue which adds adjustment of saturation -- for example, green -- green, when it is made (G), and SW15 is moved in the direction of SW9 -- hue HG of (G) green, when the color which it has becomes more vivid and SW9 is conversely moved in the direction of the white point 42 -- hue HG of (G) The color which it has becomes lighter. The amount which becomes vivid and the amount which becomes light at this time are distance **lG from the normal position 43 of SW15. It is determined.

[0054] Therefore, when green, the color tone ready directions section 7 calculates amount **lG of gaps from the normal position 43 of SW15 (white point 42 direction is made negative), and the adjustment approach of saturation directs adjustment of saturation in the color tone ready vessel 8. the color tone ready machine 8 which received directions has green image data (L, H, S) -- hue HG of (G) It judges whether it is in a field, and if it is in within the limits, **S=fSG (**lG) will be added to the saturation S of the original image data. If there is nothing to within the limits, the saturation S of the original image data will be passed as it is. namely, -- if it becomes HGmin<=H<=HGmax -- S'=S+fSG(**lG) =S+**SH<HGmin -- or it will be referred to as S'=S if it becomes H>HGmax. fSG expresses a function here and the calculated value by this function can consist of look-up tables etc. It can adjust similarly about saturation adjustment of other hues other than green. In addition, although saturation adjustment here was performed according to the hue H of the original image data, it is also possible to perform saturation adjustment to adjusted hue H'.

[0055] In addition, although considered as the switch group as shows the configuration of the color tone ready directions section 7 to drawing 3 and drawing 4 with the gestalt of this operation, the amount of directions of color adjustment or color adjustment can be seen and checked by the eye by displaying such a design on a liquid crystal display or CRT, and changing the display of a liquid crystal display or CRT corresponding to the directions inputted by the keyboard, the touch panel, etc.

[0056] Moreover, by processing 5-12 by software or hardware by computers, such as a personal computer and a workstation, among the configurations of drawing 1 , the picture signal from various picture input devices etc. is adjusted so that a user's feeling may be suited, and it outputs to various color picture formation equipments, and the optimal visible color picture can be formed.
[0057] As explained above, according to the gestalt of this operation, adjustment and operability of a color improve by adjusting lightness, a hue, and saturation each attribute data of the color space data, and here by changing each color component data of the color picture data from various picture input devices into the color space data suitable for vision and feeling of a user. Moreover, by displaying the amount of color tone ready directions in the form which suited the color space, the check of the amount of adjustment directions of a color can be performed, and the operability of a color improves.
[0058] Furthermore, the color according to liking of a user can be adjusted, without being caught by the picture input device and the image output unit.
[0059]
[Effect of the Invention] As explained above, according to this invention, it is effective in amending the gradation of a processing-object image interactively and being able to process it.
[0060]

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[Translation done.]

* NOTICES *



1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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CLAIMS

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[Claim(s)]
[Claim 1] The image-processing approach which analyzes the brightness information on a processing-object image, carries out graphical display of the analysis result, and is characterized by processing said processing-object image according to the gradation amendment condition which set up the gradation amendment condition interactively and was set up interactively.
[Claim 2] Said graphical display is the image-processing approach according to claim 1 characterized by displaying the histogram of said brightness information.
[Claim 3] Said thing [ setting up interactively ] is the image-processing approach according to claim 1 characterized by carrying out graphical display of the gradation amendment condition set up by the user.

[Claim 4] The image processing system characterized by to have the display means which analyzes the brightness information on a processing-object image, and carries out graphical display of the analysis result, a setting means set up a gradation amendment condition interactively based on the graphical display displayed on said display means, and a processing means process said processing-object image according to the gradation amendment condition interactively set up by said setting means.
[Claim 5] Said display means is an image processing system according to claim 4 characterized by displaying the histogram of said brightness information.
[Claim 6] Said setting means is an image processing system according to claim 4 characterized by carrying out graphical display of the gradation amendment condition set up by the user.

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[Translation done.]